



Approval Sheet

承認書

for

Over Temperature Protector Resistors

過溫保護電阻器

OTP series

$\pm 1\%$ & $\pm 5\%$

YAGEO CORPORATION

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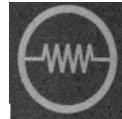
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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	Feb. 03, 2015	Feng Ye	Flora Shen
01	Update surge withstandng voltage.	Dec. 02, 2015	Feng Ye	Flora Shen
02	Revised the fuse characteristics.	May 27, 2016	Feng Ye	Flora Shen
03	Revisde the dimension ϕD , add load life test.	Jan. 13, 2017	Feng Ye	Flora Shen
04	Add package information.	Jan. 22, 2017	Feng Ye	Flora Shen
05	Revise the product description.	May. 20,2017	Feng Ye	Flora Shen
06	Soldering profile,pulse power curve, MB&MBP&PN types are included.	Sep. 18, 2017	Feng Ye	Flora Shen
07	Recommended hand-solder parameters is included.	Sep. 22, 2017	Feng Ye	Flora Shen
08	Revised the dimension of MBP type.	Sep. 25, 2017	Feng Ye	Flora Shen
09	OTP2SS type is included.	Aug.06, 2018	Mingfa Liu	Feng Ye
10	The packing reel type is included.	Oct .30, 2019	Mingfa Liu	Feng Ye
11	Revised the dimension "A" of tape on reel packing , Add dimension "B" for tape on reel packing.	Feb .25, 2020	Mingfa Liu	Feng Ye
12	Revised the dimension.	Mar .09, 2020	Mingfa Liu	Feng Ye
13	"73-" special type is deleted.	Apr .17, 2020	Mingfa Liu	Feng Ye
14	"73-"special type and PN type are included.	Jun .30, 2020	Mingfa Liu	Feng Ye

Description	Over Temperature Protector Resistors		
Series	OTP	Rev.	14



1. PRODUCT 產品描述:

The Over Temperature Protector Resistors (OTP) is a unique designed for high reliability applications requirement, it is a new type of power resistors, with functions of over temperature and over current protection, where the over temperature protector is placed inside the resistor.

This product is constructed with both wire-wound resistor and over temperature protector as a unit, therefore, it must not be compared or regulated with fuse.

(過溫保護電阻器是針對高信賴性電路的應用需求設計，這是新型的功率電阻器，具有過溫或過流時對電路進行保護的作用，過溫保護器件包含在電阻內部；此產品是繞線電阻與過溫保護器相連成一體，本身還是電阻，不能完全等同於保險絲使用)

2. PART NUMBER DEFINITION 料號定義:

Part number of the cement Over Temperature Protector Resistors is identified by the name, power, tolerance, packing, fusing characteristics, special type and resistance value and wire-wound suffix. (此料號定義包括類別、功率、精度、包裝方式、熔斷特性、特殊型別、阻值以及特殊規格後綴碼)

Example:

OTP	1WS	J	T	A	52-	10R	CM
(1) Series Name	(2) Power Rating	(3) Resistance Tolerance	(4) Packing Style	(5) Protector Characteristics	(6) Special Type	(7) Resistance Value	(8) Suffix for Alloy wire

(1) Style (類別): OTP Series

(2) Power Rating (功率): 1WS=1W, 2SS=2W

(3) Tolerance (精度): F = ±1% J = ±5%

(4) Packaging Type (包裝): B = Bulk Packing

T = Tape on Box Packing

R = Paper Taping Reel

(5) Fusing Characteristics(熔斷特性): Represents the specification of the protector characteristics, See table II

(6) Special Type (特殊型別) :

52- = 52.4mm type packing

73- = 73mm type packing

MB = MB-Type Forming

PN = PANAsert (Rated watts 2SS size only)

(7) Resistance Value (阻值): E24 Series,

Example: 1R5=1.5 ohm 10R=10 ohm ...

(8) Suffix for resistance wire : Optional code. Represents specific specification, required only when wirewound resistor is with special specification.

Example : CM, CN, FB, FE, FF, FD, CR, NT, NTJ, NR, NP And etc.



3. BAND-CODE 色環標識:

Diagram showing the color code for resistor bands:

COLOR	1st BAND	2nd BAND	MULTIPLIER	TOL.	Protector Characteristic
BLACK	0	0	1Ω		Code A
BROWN	1	1	10Ω	± 1 % (F)	Code B
RED	2	2	100Ω		Code C
ORANGE	3	3	1KΩ		Code D
YELLOW	4	4			
GREEN	5	5			
BLUE	6	6			
VIOLET	7	7			
GREY	8	8			
WHITE	9	9			
GOLD			0.1Ω	± 5 % (J)	
SILVER			0.01Ω		

4. ELECTRICAL CHARACTERISTICS 電器特性 :

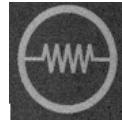
TABLE I

STYLE	OTP1WS	OTP2SS
Power Rating at 25 °C(功率)	1W	2W
Resistance Range (阻值範圍)	1Ω~100Ω	1Ω~200Ω
Maximum Working Voltage (最大工作電壓)	= $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$	
Voltage Proof on Insulation (絕緣耐電壓)	500V	
Temperature Coefficient (溫度係數)	±300 ppm /°C (Standard) ±5000 ppm /°C (Only for NiFe alloy wire types)	

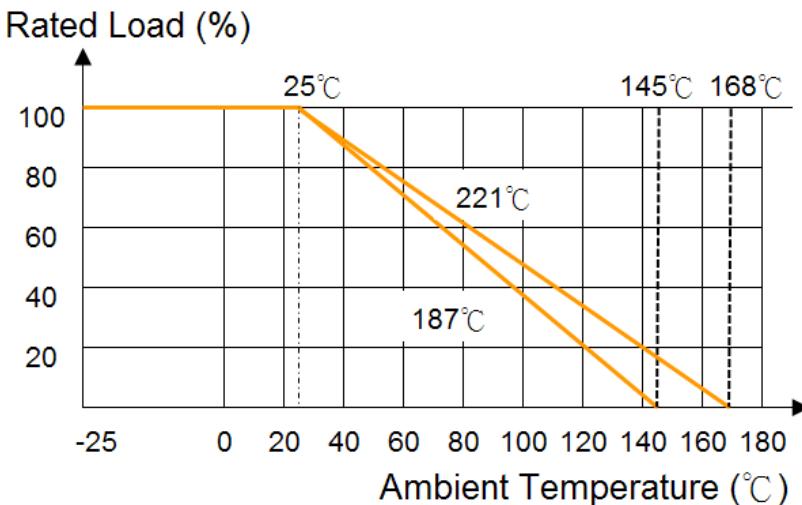
* Below or over this resistance on request.

TABLE II The Protector Characteristics 熔斷特性

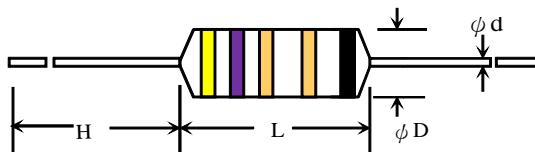
Code	Protector Standard Current(A) (過溫保護器額定電流)	Functioning Temperature (動作溫度 Tf) (for ref.)
A	3A	221
B	2A	221
C		187
D	3A	187
Short-circuit test Voltage (短路測試電壓)		250V



5. DERATING CURVE 功率降額曲線



6. DIMENSIONS 尺寸



STYLE	DIMENSIONS (unit: mm)			
	L	ψD	H	ψd
Miniature				
OTP1WS	10.5 ± 1.0	4.2 ± 0.3	25 ± 2.0	0.6 ± 0.05
OTP2SS	10.5 ± 1.0	$4.5^{+0.5}_{-0}$	25 ± 2.0 (52-type) 36 ± 2.0 (73-type)	0.6 ± 0.05

7. ENVIRONMENTAL CHARACTERISTICS 環境特性：

(1) Functioning Temperature(動作溫度 Tf)

Over temperature protector resistor shall be exposed in the test oven or oil bath, to $T_f -30^\circ\text{C}$ for devices rated until temperature has stabilized. The temperature shall then be increased steadily with a rate of rise between $0.5^\circ\text{C}/\text{min}$ to $1^\circ\text{C}/\text{min}$ until all specimens have functioned.

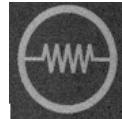
The individual functioning temperature shall be recorded and they shall be not less than $T_f -20^\circ\text{C}$ and not greater than $T_f +30^\circ\text{C}$ for devices rated.

溫度保險絲電阻放入油浴中，溫度穩定後，從 $T_f -30^\circ\text{C}$ 開始升溫，升溫速度平穩的保持 $0.5\text{--}1^\circ\text{C}/\text{min}$,直到測試樣品 Function. 實際的 Function 溫度必須在 $T_f -20^\circ\text{C}$ 到 $T_f +30^\circ\text{C}$ 溫度範圍之間。

(2) Terminal Strength(引出端強度)

To fix the resistor body vertically, a static load of 10 N is to be gradually applied on the lead terminal for 60 seconds , without any mechanical damage.

溫度保險型電阻保持引腳垂直，在引腳末端加上 10 N 的砝碼，保持 60 s，無機械損傷。



(3) Short Time Over Load Test 短時間過負載測試

At 2 times of the rated voltage applied for 5 seconds, the resistor should be free from defects after the resistor is released from load for about 30 minutes

施加 2 倍額定電壓持續 5 秒，自然冷卻 30 分鐘後測量電阻值。

$$\text{Short Time Overload Voltage} = \sqrt{4' \text{ Power Rating}' \text{ Resistance Value}}$$

$$\text{短時間過負載電壓} = \sqrt{4' \text{ 額定功率}' \text{ 電阻值}}$$

The change of the resistance value should be within $\pm 2\%R$

電阻值變化率須在 $\pm 2\%R$ 以內

(4) Insulation Voltage 絶緣耐電壓

The resistor shall be clamped in the metal Block. Apply the insulation voltage specified in the "Table I" between the terminals connected together with the block for about 60 seconds, the maximum testing leadage current is AC 1.5mA. The resistor shall be able to withstand without breakdown or flashover.
將電阻夾于金屬夾具內，按“表格 I”中絕緣耐電壓值施加在導線端和金屬夾具之間持續 60 秒，測試漏電流最大值 AC: 1.5mA，電阻不能出現擊穿或電弧現象。

(5) Temperature Coefficient Test 溫度係數測試

Test of resistors above room temperature $100^{\circ}\text{C} \pm 2^{\circ}\text{C}$ (Testing Temperature 115°C to 130°C) at the constant temperature silicon plate for over 5 minutes. Then measure the resistance value.

The Temperature Coefficient is calculated by the following equation and its value should be within the range of requested.

先在室溫(t_0)下測試電阻阻值，記錄為 R_0 ；然後在高於室溫 $100^{\circ}\text{C} \pm 2^{\circ}\text{C}$ (t , 在 115°C to 130°C 之間)矽油中放置 5 分鐘，然後測量電阻值，記錄為 R 。

溫度係數用以下公式計算，實際值須在要求範圍內。

$$\text{Resistor Temperature Coefficient 電阻溫度係數} = \frac{R - R_0}{R_0} \cdot \frac{1}{t - t_0} \cdot 10^6$$

R = Resistance value under the testing temperature 測試溫度下的電阻值

R_0 = Resistance value at the room temperature 室溫下的電阻值

t = The testing temperature 測試溫度

t_0 = Room temperature 室溫

(6) Insulation Resistance 絶緣阻抗

Apply "measuring voltage" between protective coating and termination for 1 min., then measure. The measuring voltage shall be either $100V \pm 15V$ d.c. for resistors with an insulation voltage lower than $500V$ or $500V \pm 50V$ d.c. for resistors with an insulation voltage equal to or greater than $500V$.

The test resistance should be $\geq 100M\text{ ohm}$.

在電阻保護殼表面和導線端施加測試電壓 1 分鐘，然後測量阻抗值。當絕緣耐電壓值小於 $500V$ 時測量電壓為 $100V \pm 15V$ d.c.；當絕緣耐電壓值大於或等於 $500V$ 時測量電壓為 $500V \pm 50V$ d.c.。

測試絕緣阻抗值須 $\geq 100M\text{ ohm}$.

(7) Load Life 負荷壽命

Placed in the constant temperature chamber of $25 \pm 3^{\circ}\text{C}$ the resistor shall be connected to the lead wire at the point of 25mm. Length with each terminal, the resistors shall be arranged not much effected mutually by the temperature of the resistors and the excessive ventilation shall not be performed, for 90 minutes on and 30 minutes off under this condition the rated D.C. voltage is applied continuously for $1000+48/-0$ hours then left at no-load for 1hour, measured at this time the resistance value.

The change of the resistance value shall be within $\pm 5\%$

There shall be no remarkable change in the appearance.



將樣品放於 $25 \pm 3^{\circ}\text{C}$ 的恒溫室內，電阻接在測試治具上並保持 25mm 的間距，電阻之間不會通過電阻本身的溫度而互相影響，實驗室不可過多通風。施加額定電壓開 90 分鐘關 30 分鐘持續循環 1000+48/-0 hours，然後斷電放置 1 小時後，測量電阻值。

測試後電阻值變化率需在 $\pm 5\%$ 內。測試後電阻表面須無明顯變化。

(8) Surge Voltage Withstanding 雷擊浪涌測試

The resistors are designed to withstand 1.2/50 μs pulse voltage according to IEC61000-4-5, test for a total of 20 pulses, 60 seconds between each pulse.

The designed standard withstanding pulse voltage is minimum 1KV, special voltage is on request.

The resistance value change rate between pre-and -post test shall be within $\pm 5\%$.

The customized designing withstanding pulse voltage as below:

按照 IEC60115-4-5 的標準，將此電阻安裝在模擬電源電路中施加 1.2/50 μs 雷擊電壓，測試共 20 次，每次間隔 60 秒。

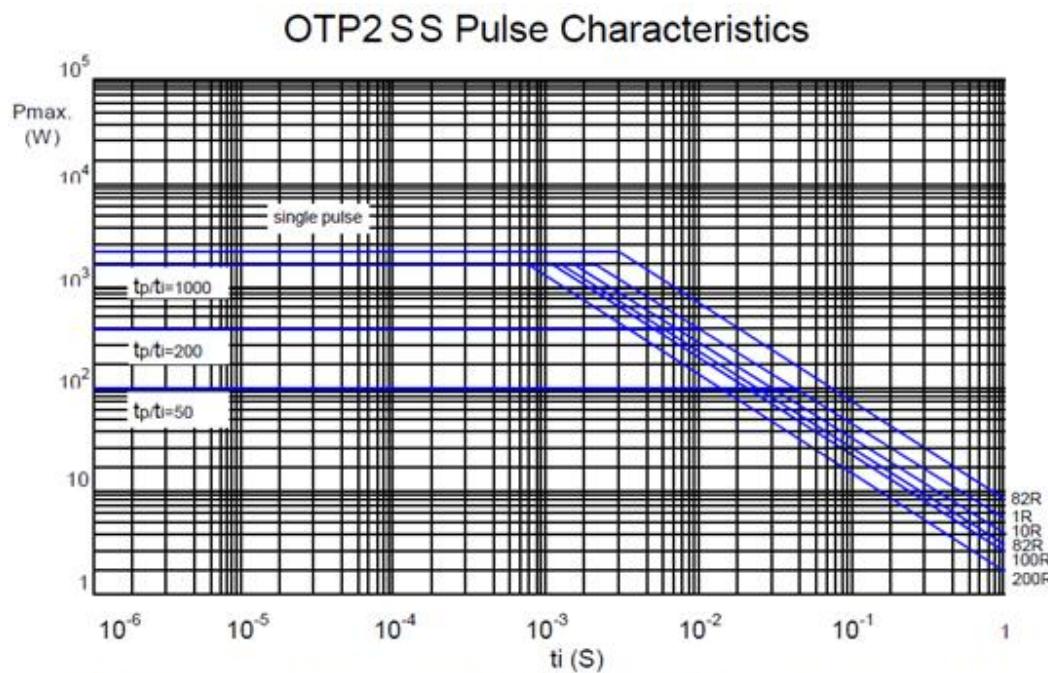
設計的標準測試電壓是最少 1KV，可按客戶要求設計不同的抗浪涌電壓

測試前後電阻值變化率須在 $\pm 5.0\% + 0.05\Omega$ 內

例：按客戶要求設計以下料號耐雷擊浪涌電壓如下：

P./N.	Withstanding Pulse Voltage
OTP1WSJTC52-10RFD	1.8KV

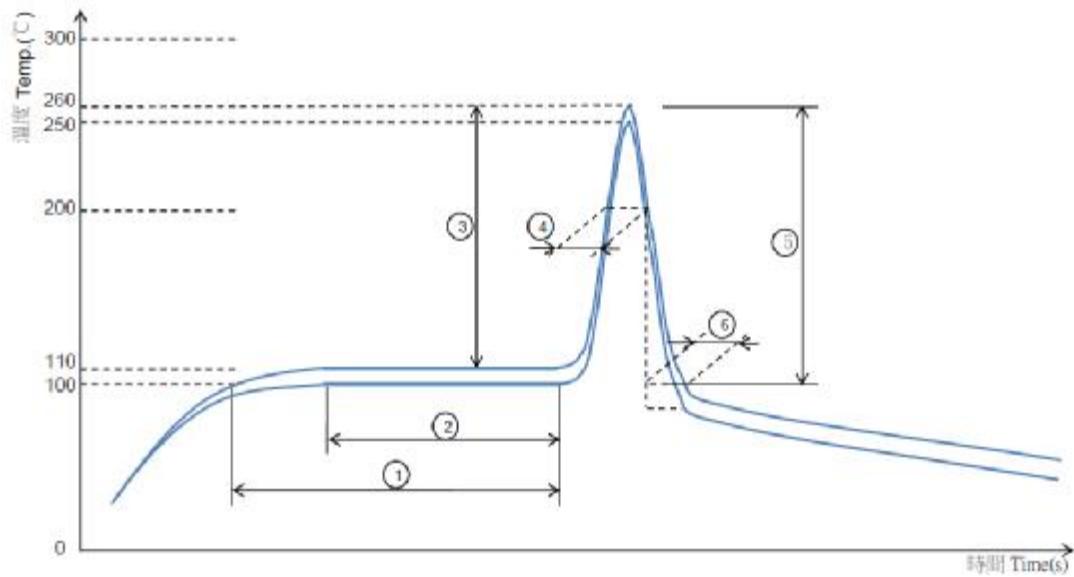
8. PULSE POWER CHARACTERISTICS





9. SOLDERING PROFILE RECOMMENDED

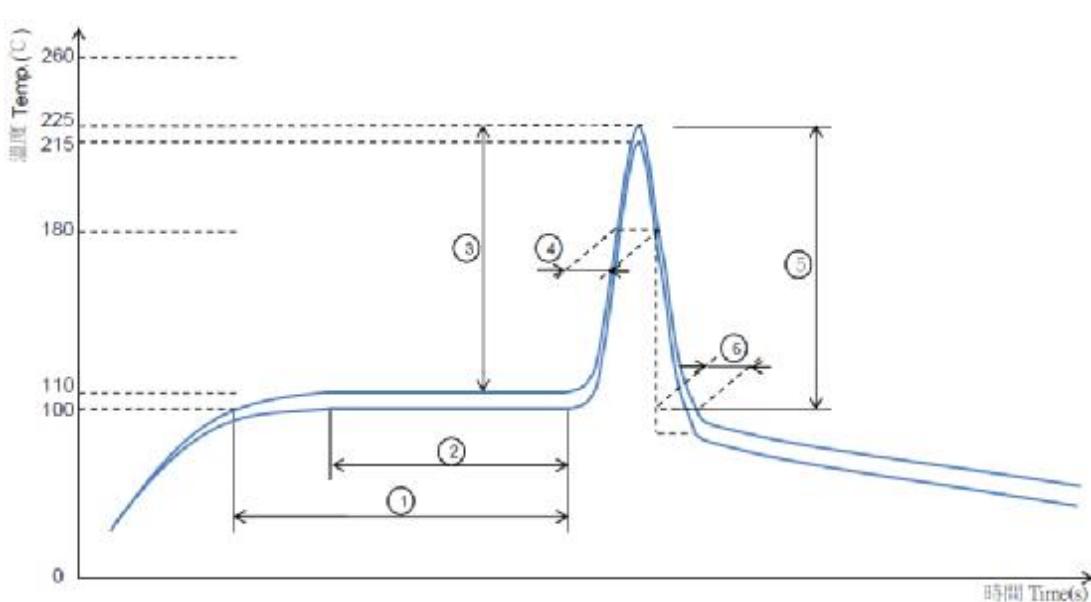
Recommend wetting conditions



系列：OTP series, thermal fuse 221°C

预热时间 Preheat time : (①<150s ②≤100s) ③ $\Delta T \leq 150^\circ\text{C}$ ④过锡时间 Dip time : ≤4s ⑤ $\Delta T \geq 160^\circ\text{C}$ ⑥降温时间 Temperature dropping time : ≤4s

以上曲线仅供参考，量产前请确认，以免损伤温度保险丝。



系列：OTP series, thermal fuse187°C

预热时间 Preheat time : (①<150s ②≤100s) ③ $\Delta T \leq 150^\circ\text{C}$ ④过锡时间 Dip time : ≤4s ⑤ $\Delta T \geq 160^\circ\text{C}$ ⑥降温时间 Temperature dropping time : ≤4s

以上曲线仅供参考，量产前请确认，以免损伤温度保险丝。



10. RECOMMENDED HAND-SOLDER PARAMETERS

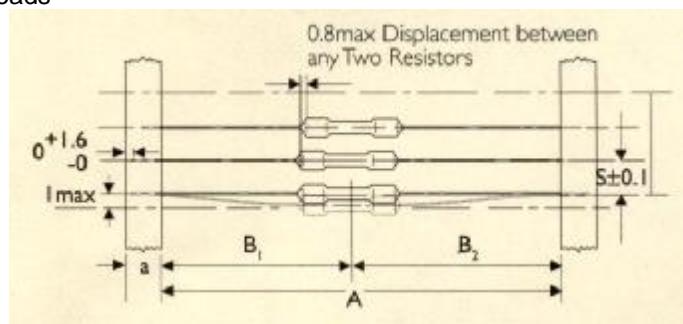
Solder Iron Temperature: $350^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Heating Time: $\leq 3\text{s}$

Distance between solder point and resistor body: $> 3\text{mm}$

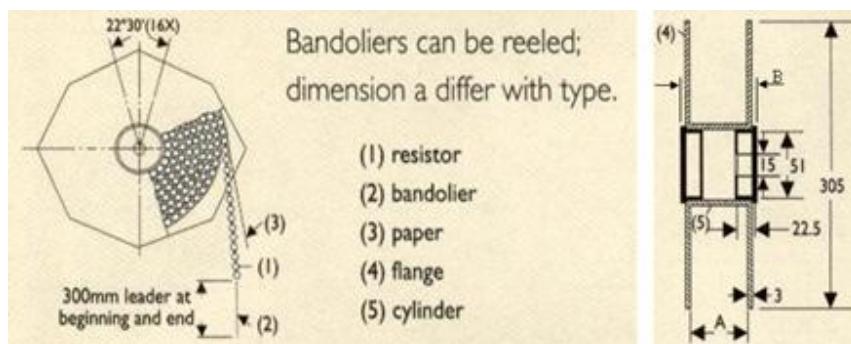
11. PACKING METHODS

Bandolier for Axial leads



STYLE	DIMENSIONS				Unit: : mm
Miniature	a	A	B1-B2	S(spacing)	T (max. deviation of spacing)
OTP1WS	6 ± 0.5	52.4 ± 1.5	1.2	5	1mm per 10 spacings, 0.5mm per 5 spacings
OTP2SS	6 ± 0.5	73.0 ± 1.5	1.5	5	
		52.4 ± 1.5	1.2		

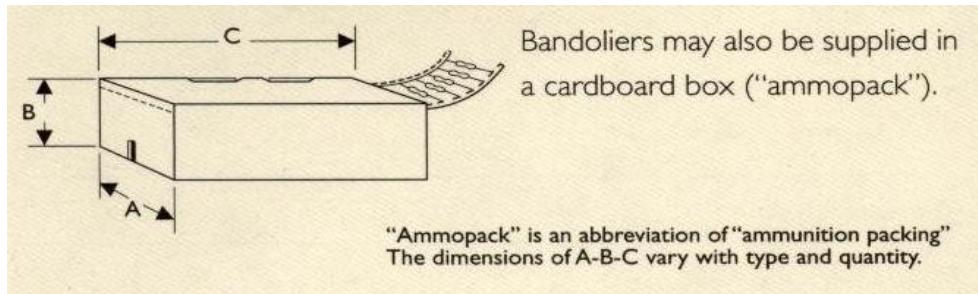
12. TAPE ON REEL PACKING



STYLE	TAPE ON REEL		
Miniature	ACROSS FLANGE (A)	B	Qty per reel
OTP1WS	66.5	75.5	2500
OTP2SS(52- type)	66.5	75.5	2000
OTP2SS(73- type)	87	96	2000



13. TAPE ON BOX PACKING

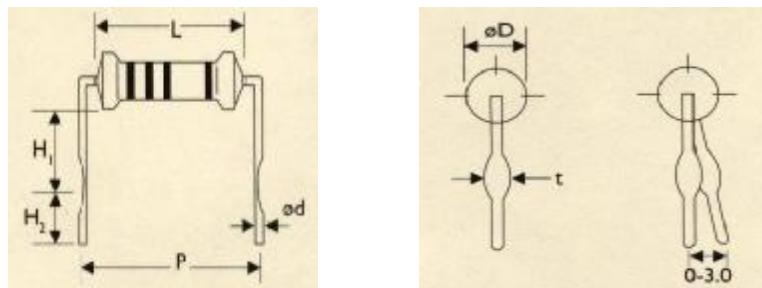


STYLE	Qty per box
Miniature	
OTP1WS	1,000
OTP2SS	1,000

14. SPECIAL TYPE (FORMING DIMENSIONS)

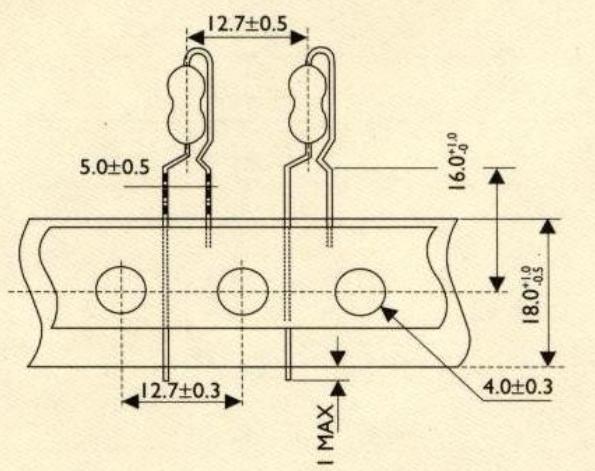
Recommended below types for wider soldering temperature range.

MB TYPE



STYLE	DIMENSIONS						UNIT : mm
	L	ϕD	ϕd	P	H 1	H 2	t
Miniature							
OTP1WS	10.5 ± 1.0	4.2 ± 0.3	0.6 ± 0.05	12.5 ± 1	6.0 ± 1	5.0 ± 1	1.4 ± 0.2

PN Type Forming for Taping (Rated watts 2SS size only)





15. Plant Address 工廠地址：

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